Techni-talk
COMPLETE ELECTRONIC SERVICING INFORMATION
radio · tv · hi-fi

Vol. 15, No. 1 Spring, 1963

How to Measure HV Rectifier Filament Voltage

A simple device employing two lamps has been devised to measure the voltage across the filament of a T.V. high voltage rectifier tube. By adjusting the intensity of one lamp to equal that of the other, the filament voltage can be read with the use of a D.C. voltmeter. The complete unit is shown in Fig. 1, and the circuit in Fig 2.

This device can be easily constructed and at a reasonable cost. Placement of the various parts can be seen in Fig. 3 which is a view of the unit with the bottom removed.

Pilot Lamps Used

The schematic diagram shows how the lamps are used to measure the rectifier filament voltage. Lamp No. 1 is connected across the filament source voltage. This is done by removing the rectifier tube from the socket and replacing it with one of the leads shown in Fig. 4. Each lead, one for octal base tubes and the other for miniatures, consists of a tube base to which has been attached leads which transmit the filament source voltage to the box housing the lamps.

Rod Prevents Arcing

An insulating rod has been attached to the tube base to plug on the rectifier plate lead. This prevents arcing between the plate lead and the T.V. chassis since the plate lead is in the same position as when connected to the rectifier tube. Care must be taken to keep the filament leads approximately an inch from the rectifier plate lead to prevent arcing between the two.

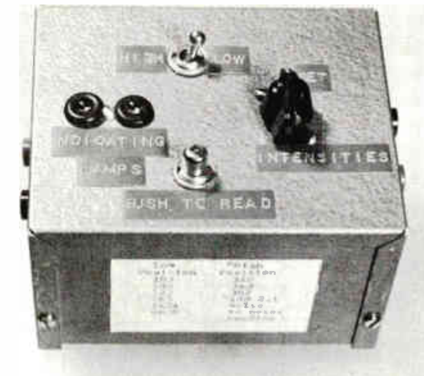


Fig. 1 Complete unit assembled in a 4" x 4" x 3" metal utility box.

Each of the leads were made about three feet long. One was connected to an octal base plug and the other to a 9-pin noval base plug. Two banana plugs were attached to the other end of each lead. An octal base plug can be salvaged from an old tube. The nine pin base will probably have to be purchased from your G-E tube distributor. In case he has to order one, it is listed in the Radio-Electronic Master catalog. One manufacturer is the Vector Electronic Co., Inc., catalog number P9.

Resistor Increases Range

A 10 ohm resistor in parallel with a SPST switch (see Fig. 2) is put in series with lamp No. 1 in order to measure a wider range of filament voltages. With the switch in the low position (as indicated in Fig. 1) the 10 ohm resistor is shorted. Filament voltages up to 1.5 volts can be measured in the low position. In the high position the 10 ohm resistor is in series with lamp No. 1. Filament voltages up to 3.6 volts can now be measured.

Lamp Voltage Limited

The upper limit on filament voltage for each switch position must not be exceeded or else lamp No. 1 will burn out. The lower limit on filament voltage for each switch position is determined by the smallest amount of light emitted from lamp No. 1 that the eye can detect. These voltages are 2.4 volts and 0.4 volts respectively for the high and low switch positions. Of course, these values vary slightly from lamp to lamp. The limits described above fit rectifier tubes whose rated filament voltages are either 1.25 volts or 3.15 volts. These filament voltages are the ones the device was designed to measure.

(Continued on page 3)

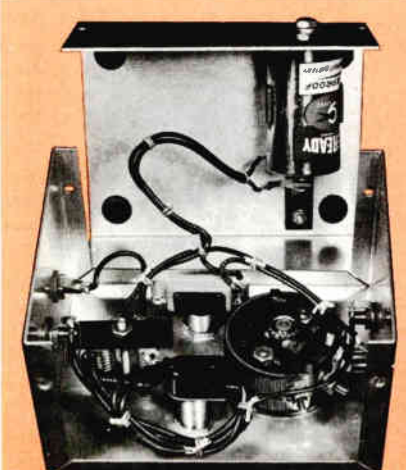
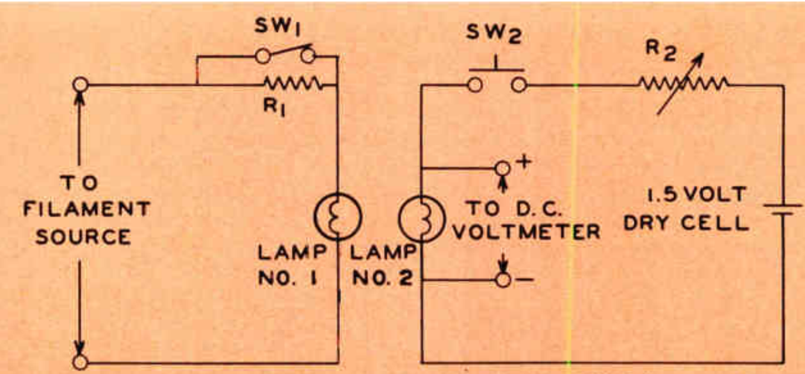


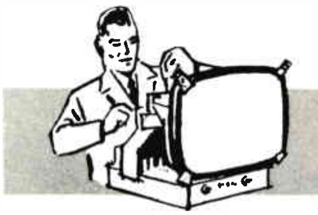
Fig. 3 Inside construction.



Lamps No. 1 and No. 2 —
G.E. No. 112 1.2V., 0.22A.
Filament Source Plugs —
2 Insulated Banana Jacks.
Voltmeter Plugs — 2 Insulated Tip Jacks.

R-1 — 10 ohms ½W 5%.
R-2 — 5 ohms ½W Linear Potentiometer.
SW1 — ½A SPST Switch.
SW2 — ½A normally open push button switch.
Metal Utility Cabinet — 4" x 4" x 3".

Fig. 2 Circuit diagram for the Filament Voltage Measuring Device.



BENCH NOTES

KNOB SPRINGS No. 1

The iron core laminations of discarded output transformers, when cut to correct size, give us an inexhaustible source of supply of knob springs. The laminations make excellent springs or wedges for almost any type of knob.

Stan Clark
Box 2162
East Bradenton, Fla.

KNOB SPRINGS No. 2

Do not throw that old coiled clock spring away! This is good steel and you have a life-time supply of knob springs. By using your dikes they can be broken off to any size and shape as you need them.

Wm. R. Brown
Bruce TV
407 Deckbar Ave.
New Orleans 21, La.

Editor's Note: Here are two different sources of supply for knob spring material. Although the basic material is different they should both work satisfactorily.

YOKE SHAPER

Often when I find it necessary to replace a C.R.T. in TV sets that have been in service for a number of years it is very difficult to replace a new C.R.T. in the old deflection yoke. It seems that the yoke coils shrink enough on the inside diameter that it is very hazardous to force a new tube into the old yoke and very costly to replace the yoke with a new assembly.

A very easy fix that I have used many times is to use a 1⅜" Electrolytic can and force it through the deflection coils small end first. As the can progresses through the yoke the small flange near the base of the can will force the coils back in place.

In as much as the aluminum case is very soft it will not harm the varnish on the coils. After the re-forming operation is completed a new G-E C.R.T. may be installed safely.

Lawrence W. Herman
3813 Wood Street
Erie, Pa.

FEATHER DUSTER

A great tool in dusting out a TV Chassis, particularly around the hard to get at components in the HV cage is a large "Fowl" feather. You'd be surprised how easy it is to use around the small components and wires, under the chassis too. It's easy on all the small parts, and feather light. A few flicks of the feather loosens the dirt; then you can use either a flashlight type of vacuum cleaner, or else blow the loose dirt off the chassis.

I've been using a large turkey feather as they are readily available anytime of year; also useful on air condensers, in transmitters, receivers, or most anywhere dust accumulates, and within any electronic chassis where it is difficult to use a brush.

Bernard J. Beck
41 Old Northpost Road
Huntington, L.I., N.Y.

FITTING SPLIT-KNURL KNOBS TO ROUND SHAFTS

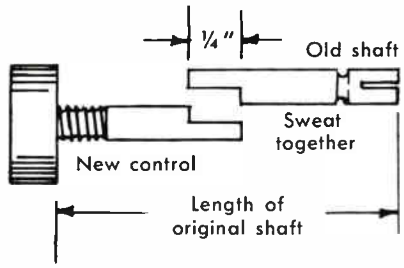


Fig. 1

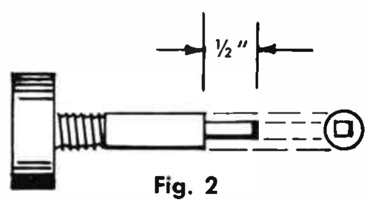


Fig. 2

Frequently it is necessary to replace a control having a split-knurl shaft. Usually it is impossible to find a set-screw knob whose appearance matches the other knobs on the set. Here are two methods of fitting the original knob to the new control:

1. Saw off the shaft of the old control ½" or more behind the knurled portion. Saw off the shaft of the new control ½" longer than the difference between the necessary final length and the length of the piece sawed off the old shaft. Accurately file a flat area ½" long down to the center of each shaft and sweat together with solder or silver solder, as shown in Fig. 1.

2. An easier method if the knob is not worn out is to simply file the end of the shaft of the new control to a square cross-section, ¼" on the diagonal, for about ½" as shown in Fig. 2 above.

B. C. Barbee
Barbee Radio Lab
1501 South Street
Nacogdoches, Texas

"Did a mischievous little boy come back here?"

TIME AND LEAD SAVER

Much time may be lost replacing a component on a printed circuit board when the hole or holes are obstructed with solder. While the solder is hot, insert a toothpick and turn as the component is removed.

The result will be a nice rounded hole, and the new component will now fit in easily. Add to this the fact that in many cases you don't even re-lead the joint. Just reheat the old solder around the hole and your component is in "like new."

Sylvester A. Dolfi
1119 Locust St.
Pittsburg 19, Pa.

SEWING NEEDLE TESTS CIRCUITS

To save time while trouble shooting, solder a medium size needle to a phone tip jack. It can be attached to your test probe and pushed through the wire you want to check. You won't have to feel your way to the end of the wire or take off covers that have numerous screws holding them in place. To keep the needle from being damaged when not in use, push it into a cork or gum eraser.

Ray F. Rocha
710 W. Washington
Council Bluffs, Ia.

ANTENNA CONNECTOR

An antenna strip with an alligator clip soldered to each back terminals is very useful for use on tuners which just have the leads coming out.

Mel's Radio & TV Service
10632 South US 131
Kalamazoo, Mich.

HANGING SHELF

I wanted my test instruments within easy reach over my bench. I hung a 7 foot x 12 inch board over the bench by using dime store wrought iron legs. I attached one end of the legs to the board and the other end to the basement rafters. I inclined the board forward and put a 1" x 1" board along the front. Looks and works fine.

Arthur Bear
26775 Constance
Dearbon 4, Mich.

Editors Note: Heavy eye bolts can also be used at a lower cost.

TEMPORARY COTTER PINS

When making trial-and-error adjustments on parts assemblies or appliance components that have a number of cotter pins, it's time-wasting to install and remove the cotters many times during the needed adjustments.

Using ordinary safety pins as temporary substitutes for the cotters speed the task.

Harry J. Miller
Advance Television-Radio
991 Forty-Second St.
Sarasota, Fla.

Those desiring to have letters published in this column should write the Editor, Techni-Talk, Electronic Components Division, General Electric Company, Owensboro, Kentucky. For each such letter selected for publication you will receive $10.00 worth of General Electric tubes. In the event of duplicate or similar items, selection will be made by the Editor and his decision will be final. The Company shall have the unlimited right without obligation to publish or otherwise use any idea or suggestion sent to this column. Caution: The ideas and suggestions expressed in this column are those of the individual writers. These ideas and suggestions have not been tried by the General Electric Company and therefore are not endorsed, sponsored or recommended.

G-E HORIZONTAL PHASE DETECTOR III

In the last issue, the basic circuit for developing a horizontal control voltage was discussed. The last illustration (Fig. 6) showed the apparent effect of C_1 and C_2 in relation to sync pulses. This in effect had taken R_2 and Y_1 and folded them over into the same configuration as Y_2 and R_1.

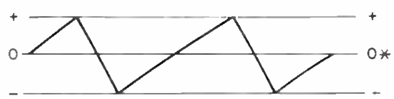
There are four factors that contribute to this:

1. The negative pulses are coupled to the cathodes of both diodes as these are definitely tied together.
2. These pulses are short-duration pieces of information.
3. C3 is small — 39 uufd.
4. The effective capacity of C1 and C2 is 450 uufd — a ratio of at least 10 to 1 with C3.

If we apply negative going sync-pulses to this circuit, (with reference voltage in step), we cause both diodes to again draw equal current, rebiasing the diodes.

This will occur in spite of the back bias created by the reference voltage because the sync pulses are somewhat greater in amplitude than the reference voltage. As the pulse amplitude exceeds this bias, current can flow for that short duration only. Referring again to Fig. 5 in the Vol. 14, No. 6 issue, it may be seen that now the diodes become more positively biased by the sync pulses which assume control of the circuit because of their greater amplitude. As they cause current to flow in either or both diodes, a positive back bias is created at the cathodes cutting off conduction except on the very tips.

This positive charge is developed across C3 by the negative-going sync pulses in exactly the same manner as the negative charge was developed across the capacitor in the discussion of Fig. 11 and Fig. 12 in the Vol. 14, No. 5 issue.



*Time and Zero Voltage Axis

Fig. 1. Oscillator Sawtooth

Let's examine some waveforms now in order to see exactly how this takes place.

Fig. 1 represents two cycles of saw-tooth reference voltage. The center zero line is the axis about which the sawtooth occurs. At the extreme left, it is zero voltage and time. As time commences, the voltage rises gradually to a positive peak and then decays, falling through the zero voltage axis to a negative peak and then returning to zero, whereupon the cycle is continuously repeated. It is very important to remember that the axis line represents time as well as zero voltage. As we are speaking of the horizontal freuency, for example, the point at which the first waveform cycle is completed represents one fifteen-thousand, seven-hundred and fiftieth of a second (1/15,750 Sec.) later than the point where it began (63.5 microseconds).

Referring again to Fig. 5, in the last issue, we can say that during the positive half of the waveform shown in Fig. 1, Y1 conducts, and during the negative half Y2 conducts.

In order to accurately visualize this phenomenon, it is necessary to understand that the AC waveform must be viewed from two perspectives.

The positive half of the wave form seen by Y1 appears to be negative to Y2. Conversely the negative half as applied to Y1 appears positive to Y2.

Assuming that we have finally adjusted the receiver to a picture and that everything is such that no correction is required, Fig. 2 shows what is taking place.

As the synch pulse arrives at the same time that the reference voltage crosses the zero axis, the same

(Continued on Page 7)

HOW TO MEASURE HV RECTIFIER FILAMENT VOLTAGE

(Continued from page 1)

It was found that the impedance connected to the filament source voltage did not have to match that of the rectifier filament. The filament source was found to be a low impedance voltage source; therefore, the filament voltage is essentially independent of the load. However, the G.E. No. 112 lamp's filament impedance closely resembles that of the rectifier filament. It should also be mentioned that there was no appreciable change in the voltage of the filament source when the rectifier tube was removed to measure the filament voltage.

Now the right hand half of the circuit in Fig. 2 will be explained. Lamp No. 2 in series with a push button switch and a 5 ohm linear potentiometer is connected across a 1.5 volt dry cell. The push button switch was put in the circuit instead of a SPST switch to increase the life of the dry cell. The potentiometer varies the intensity of lamp No. 2. Two terminals connected directly across lamp No. 2 are located on the box housing the lamps. A voltmeter (approximately 2 volts full scale) connected to the terminals indicates the rectifier tube filament voltage provided the intensities of lamp No. 1 and lamp No. 2 are equal. The 2.5 volt scale on a multimeter can be used in place of the voltmeter.

It should now be pointed out that the device described herein does not actually measure the filament source voltage. The device indicates how much D.C. voltage is needed to make the power input of lamp No. 2 equal to that of lamp No. 1. It must be remembered that the intensity of a lamp is directly proportional to the power input; therefore, when the intensity of lamp No. 1 is equal to that of lamp No. 2, their power inputs are also equal provided the lamp filaments are exactly alike. Since the rectifier tube filament ratings are given in terms of D.C. quantities on the specification sheets, it is then desirable to compare the filament source voltage with a D.C. voltage which will give the same filament heating effect.

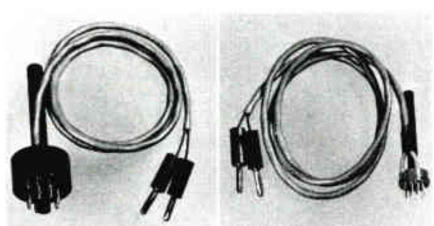


Fig. 4 Leads to connect unit to rectifier socket.

With the switch in Fig. 2 in the low position (10 ohm resistor shorted), the D.C. voltmeter readings reuire no correction factor. But in the high position, the power loss in the 10 ohm resistor must be accounted for. Therefore, with the switch in the high position 2.1 volts must be added to the voltmeter readings.

Table 1 illustrates how accurately it was possible to set the intensity of lamp No. 2 to equal that of lamp No. 1. The circuit in Fig. 3 was used but the filament source was replaced with a 60 cycle variable A.C. source. The data indicates an accuracy of ± .1 volts. The accuracy may vary slightly when the lamps are replaced.

PRACTICAL RESULTS

By matching the intensity of lamp No. 2 with that of Lamp No. 1, accuracy within ± 0.1 volt was obtained:

VOLTAGE SET ACROSS LAMP No. 1	VOLTAGE MEASURED ON LAMP No. 2
0.45	0.55
0.80	0.82
1.00	1.00
1.30	1.28
2.40	2.55
2.80	2.77
3.00	3.10
3.30	3.24

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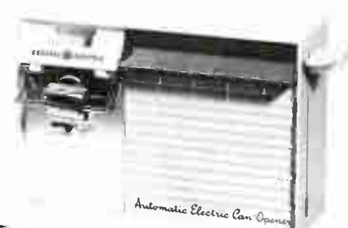

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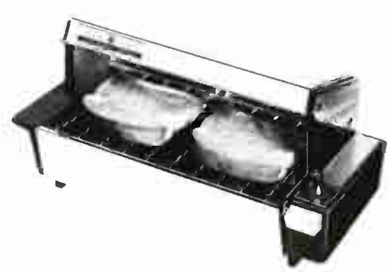

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TELEVISION

Production Changes on General Electric "MW" Chassis

The Vol. 13 No. 5 issue included a Tele-Clue Schematic on the "MW" line of TV receivers. During production the following changes were made.

MAIN CHASSIS

1. To increase picture tube beam current the value of resistor R176 in cathode circuit of picture tube was changed from 180,000 to 150,000 ohms in all 23" receivers coded 117MW and above.

2. In chassis bearing code 125MW and above, the high voltage rectifier tube was changed from a 1J3 to a 3A3. This change necessitated the use of an additional two turns of filament winding on the horizontal sweep transformer and an additional series resistor in the filament circuit. The resistor (R268) value is 3.6 Ω, ½ watt, wire wound. This change provided controlled warm-up of the high voltage.

3. To reduce picture top bend, a 100 μμf, capacitor (C266) was added from Pin 7 of the horizontal output transformer to the junction of R263-R264 in grid circuit of 6DQ6B and was mounted on the sweep circuit board. This change was incorporated in 23 inch chassis bearing code 125MW and above and in 19 inch chassis bearing code 127MW and above.

4. In chassis bearing code 128MW and above, the value of resistor R263 was changed from 820,000 Ω to 560,000Ω. This change was made to avoid over dissipation of the 6DQ6 (V13) grid.

5. To improve current distribution, the VHF tuner R-F B+ supply circuitry was changed. Resistors R181 & R-312 were deleted and the value of R180 was changed from 15,000Ω, 4 W. to 2200Ω, 2W. This resistor (R180) is now connected from B+ 135V to the tuner R-F B+ input. To coordinate with the above, the value of resistor R160 was changed from 15 to 16 megohms. These changes are incorporated in Chassis bearing code 129MW and above.

6. To improve circuity, capacitor C170 and C171, in the video amplifier circuit, were deleted in all chassis bearing code 133MW and above.

7. To improve circuitry in chassis bearing code 134MW and above, the value of capacitors C305 and C308 in the 6DT6, audio detector circuit, are changed from 10,000 μμf. to 5,000 μμf.

8. To decrease UHF radiation, the UHF B+ dropping resistor (R2) was changed from 10,000 to 15,000 ohms. Although this change was made effective on chassis coded 125 MW and above, if replacement becomes necessary of the previous 10,000Ω units, replace with ET14X-145, 15,000 ohms.

9. To increase the audio output for models M780 and M781 coded 137MW and above, the divider resistor (R316) in the plate circuit of V8 (6DT6) was changed from 10,000 Ω to 15,000 Ω.

VHF TUNERS

1. To reduce radiation, feed-thru capacitor C120 in VHF tuners ET86-X111, ET86X113, and ET86X115 was changed from 1.5 μμf. to 6 μμf. These tuners are coded with a red color dot.

2. To improve circuitry in VHF tuners ET86X112 and ET86X114, capacitor C104 was changed from a trimmer to a 3.3 μμf. fixed capacitor. These tuners are also coded with a red color dot.

REMOTE RECEIVER

1. To increase reliability of operation at low line voltage, the value of resistor R719 was changed from 10,000Ω to 8,200Ω. Receivers incorporating this change are also stamped EN4.

RADIO

REMOVING LARGE COMPONENTS FROM DOUBLE-SIDED BOARDS

Some service technicians reported difficulty in removing some of the larger components such as I.F. cans, transformers, couplates, etc., from the double-sided circuit boards (as used on radio models P830E and P820) without damaging the board. To remove one of these components, break apart the defective component with pliers or cutters, and then unsolder the individual pins of the component one at a time.

To remove I.F. transformers, first unsolder the two ground connections from the transformer cover to the conductor pattern below and lift the cover off. The transformer coil forms and pins then become accessible.

D.C. ISOLATION FOR RADIO MODELS P835A, P840A, B, and P870A

A word of caution on the servicing of radio models P835A, P840A, B, and P870A. The audio output terminals of these radios must be D.C. isolated from ground during servicing procedures. This is to prevent the audio output transistors from becoming damaged by excess voltages in the audio circuit. Therefore, care must be exercised in using test equipment that may cause a DC path to ground.

Use of a VOM creates no particular problem as the meter is isolated from ground. If a VTVM is used, a 100 MFD 200 volt electrolytic capacitor must be inserted in the negative probe to isolate the VTVM.

G-E Horizontal Phase Detector III

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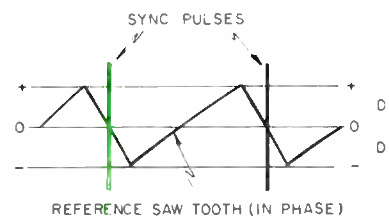

Fig. 2. Sync Pulses and Sawtooth in Phase

amount of current flows in each diode so everything cancels out and we have zero. This probably seems like a lot of work to get nothing. It should be remembered, however, that the complicated system of brakes on an automobile has no function until it desired to stop.

It should be remembered that conduction only takes place now during the short intervals that the sync tips exceed the reference voltage peaks. As the sync pulse is applied to both diodes at the same time, only the one whose reference voltage is of the correct polarity to cause conduction at that instant will be affected.

(To be Continued)

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All Tele-Clues and Tele-Clue Schematics published to date with the same binder described above is available as ETR-1095A, at $4.35.

All of the above publications can be obtained from your General Electric tube distributor. For your convenience the order coupon on Page 7 may be used to order these publications direct from our Chicago warehouse.

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Kempton's Korner

During recent visits to service dealers one of the stock questions seemed to be "Why do tube manufacturers keep adding so many tube types?"

This is a very logical question. The large number of tube types do present a real problem to service dealers. Tube manufacturers are also concerned because many of the same service dealer problems such as stocking and increased inventory are multiplied many times for the manufacturer. In addition a multitude of additional problems plague the manufacturer such as new jigs and special parts for assembly, branding and testing. If it were possible to only manufacture a limited number of tube types, all of the above mentioned problems would be alleviated.

As we all know tubes and receivers are constantly being improved. The latest model TV receivers surely indicate the progress and improvements which have been made in the past few years. Fewer tubes are now used and the performance is considerably better. In addition the overall size has been reduced and servicing made easier.

Most of these improvements can be attributed to stringent engineering requirements, foresight and cooperation between the receiver designers and the receiving tube engineers. The price we all have to pay for these improvements is an ever increasing number of tube types.

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